**Science Writing Heuristic: Freezing, Melting and Evaporating**

* **SPI 0407.9.3** Interpret the causes and effects of a physical change in matter.
* **GLE 0407.Inq.1** Explore different scientific phenomena by asking questions, making logical predictions, planning investigations, and recording data.
* **GLE 0407.Inq.2** Select and use appropriate tools and simple equipment to conduct an investigation.
* **GLE 0407.Inq.3** Organize data into appropriate tables, graphs, drawings, or diagrams.
* **GLE 0407.Inq.4** Identify and interpret simple patterns of evidence to communicate the findings of multiple investigations.
* **GLE 0407.Inq.6** Compare the results of an investigation with what scientists already accept about this question

**Materials:** Ice cubes, resealable bags, distilled water, salt, sugar, rubbing alcohol, timer, triple beam balance, safe heat source for each group (lamp, electric heating pad, blow dryer)

**Safety:** goggles, gloves, no flame near rubbing alcohol

**Time needed:** 2-3 hours

* + **Exploration of Pre-Instruction Understanding**
    - Have students write down in their scientist’s notebook the meaning of freezing, melting and evaporating.
    - Discuss these ideas and come to a consensus as a class.
    - Ask students why salt is added to the roads before it snows? Have students record their ideas in their scientist’s notebook (under beginning ideas).
    - Ask students what they wrote and write all ideas on the board, accepting all ideas.
    - Now ask students how can they know for sure? Test it of course!
    - Ask students what would happen if rubbing alcohol were added to the roads?
    - Tell students they will design a lab to determine the factors that influence the rate at which pure water, salt water, sugar water, and rubbing alcohol melt ice.
  + **Pre-Laboratory Activities**
    - Divide students into groups of 2-4 people.
    - Use the student template to prepare scientist’s notebook for the lab
      * Beginning ideas – from exploration of pre-instruction understanding
      * Materials: distilled water, rubbing alcohol, salt water
      * Safety: eye protection, control balls
      * Hypothesis
* In their groups, students discuss ideas on how to design the lab. Remind them that they need to have a control (What the results will be compared to i.e., ice cube with nothing put on it).
  + - * Guide students to design a lab where melting can be speeded up, include mass of ice cubes before and after a specified period of time, starts with the same amount of water, salt, sugar, and rubbing alcohol in each bag.
        + Once the group has come to a consensus on how they want to do the lab, have written their procedures, materials, and safety in their scientist’s notebook, have them write their hypothesis (if – then statements are best).
        + After their materials, safety, hypothesis and design are approved, they can begin the experiment. ***GLE 0407.Inq.1 Explore different scientific phenomena by asking questions, making logical predictions, planning investigations, and recording data*** and ***GLE 0507.Inq.2 Select and use appropriate tools and simple equipment to conduct an investigation.***
        + Provide example of data table.

|  |  |  |  |
| --- | --- | --- | --- |
| **What Makes Ice Melt Fastest?** | | | |
|  | **Beginning Mass of ice cube (g)** | **Ending Mass of ice cube (g)** | **Difference (g)** |
| **Distilled Water** |  |  |  |
| **Salt Water** |  |  |  |
| **Sugar Water** |  |  |  |
| **Rubbing Alcohol** |  |  |  |

* **Participation in the Laboratory Activity**
  + - Students begin experiment
    - Monitor the process of carrying out the experiment and the recording of data.
    - Students write their observations along with their data in their scientist’s notebook.
    - After collecting data and writing their observations, students graph their data. ***GLE 0407.Inq.3 Organize data into appropriate tables, graphs, drawings, or diagrams***.
* **Negotiation Phase I – Writing Personal Meanings**
* In the Claims and Evidence section of the lab, students write an explanation of their results that explains which substance made ice melt faster. ***SPI 0407.9.3 Interpret the causes and effects***

***of a physical change in matter.***

* **Negotiations Phase II – Share Data with the Groups**
* Next students compare their findings with the other groups by writing their statements on the board, on group white boards, or on butcher paper. ***GLE 0407.Inq.4 Identify and interpret simple patterns of evidence to communicate the findings of multiple investigations.***
  + - Group discussion of results
* **Negotiation Phase III – Compare Findings to Scientific Community**
* Once findings are shared between groups, a comparison with the scientific community is next. ***GLE 0407.Inq.6 Compare the results of an investigation with what scientists already accept about this question.***
  + - This can happen by going to the textbook, appropriate internet source (BrainPOP *Matter Changing States*) , or other reliable source.
    - Group discussion of results
* **Negotiation Phase IV- individual Reflection** 
  + - In the Reflection portion of their lab, students compare their hypothesis with their findings and write down how their ideas have changed and if they have any more questions.
    - After comparisons are made, students write in their scientist’s notebook, the best explanation of what they learned in the Writing section.
    - It is important for students to write their opinions of the experience in their scientist’s notebook as well
* **Exploration of Post-Instruction Understanding/ Enhancement**
  + - Reading students’ Reflection and Writing portion of the lab can indicate student understanding.
    - As a follow-up, students can come up with a design to make homemade ice cream (in resealable bags) using the substance that melted ice quickest.
    - Have students research what is used on roads in their city to help melt snow and ice. Have them find out how much is purchased each year, what it costs, at what temperature does it stop working and what happens, what, if anything, is used when it gets below that critical temperature, and if there are any alternatives to what they are using. They can also research if there are any environmental concerns with use of such substance.